

Amendments to the Claims

The listing of claims below will replace all prior versions and listings of claims in the present application.

Claim Listing

1 1. (Cancelled)

1 2. (Previously Presented) A method for routing packets in a router, the method
2 comprising:

3 receiving a plurality of packets in a first order;

4 storing said plurality of packets in a packet reorder buffer;

5 forwarding said plurality of packets in a second order from said packet reorder
6 buffer;

7 determining a plurality of hash values using information contained in said
8 plurality of packets;

9 storing said plurality of hash values in said packet reorder buffer; and

10 using said plurality of hash values to determine said second order.

1 3. (Original) The method of claim 2, wherein a first subset of said plurality of
2 packets having a common hash value is forwarded in an order in which said first subset is
3 received by said router.

1 4. (Original) The method of claim 2, wherein said hash value is determined
2 using a destination address of said plurality of packets.

1 5. (Original) The method of claim 2, wherein said hash value is determined
2 using a source address of said plurality of packets.

1 6. (Original) The method of claim 2, wherein said hash value is determined
2 using a protocol used by said plurality of packet.

1 7. (Original) The method of claim 2, wherein said hash value is determined
2 using an address of at least one incoming port used by said plurality of packets.

1 8. (Original) The method of claim 2, wherein said hash value is determined
2 using an address of at least one outgoing port used by said plurality of packets.

1 9. (Original) The method of claim 2, further comprising:
2 setting a status of said plurality of packets in said packet reorder buffer to 'not-
3 ready'.

1 10. (Original) The method of claim 8, further comprising:
2 selecting a 'head of line' packet from said packet reorder buffer, said 'head of
3 line' packet is a packet that is stored in said packet reorder buffer for
4 longest period of time; and
5 identifying said 'head of line' packet using a 'head of line' pointer.

1 11. (Original) The method of claim 10, wherein said 'head of line' pointer is a
2 software based pointer.

1 12. (Original) The method of claim 10, wherein said 'head of line' pointer is a
2 hardware-based pointer.

1 13. (Original) The method of claim 10, further comprising:
2 locating a routing information for said plurality of packets in a cache;
3 if said routing information is not located in said cache,
4 locating said routing information in a lookup table; and
5 when said routing information is located, setting said status of said plurality of
6 packets in said packet reorder buffer to 'ready'.

1 14. (Original) The method of claim 13, further comprising:
2 selecting a first packet with a 'ready' status from said packet reorder buffer;

determining whether said first packet is 'head of line' packet.

15. (Original) The method of claim 14, further comprising:

if said first packet is 'head of line' packet,
removing said first packet from said packet reorder buffer,
forwarding said first packet, and
if said packet reorder buffer is not empty,
moving said 'head of line' pointer to one of said plurality of
packets that is stored for longest period of time in said
packet reorder buffer.

16. (Original) The method of claim 15, further comprising:

if said first packet is not said 'head of line' packet,
locating said 'head of line' packet in said packet reorder buffer,
determining whether said first packet and said 'head of line' packet have a
common hash value, and
if said first packet and said 'head of line' packet have a common hash
value,
selecting a second packet with a 'ready' status from said packet
reorder buffer.

17. (Original) The method of claim 16, further comprising:

if said first packet and said 'head of line' packet do not have a common hash
value,
identifying a second subset of said plurality of packets having a common
hash value with said first packet from said packet reorder buffer,
determining whether said first packet is stored for longest period of time in
said packet reorder buffer among said second subset of said
plurality of packets, and
if said first packet is not stored for longest period of time in said packet
reorder buffer among said second subset of said plurality of
packets,

12 selecting a third packet with a 'ready' status from said packet
13 reorder buffer.

1 18. (Original) The method of claim 17, further comprising:
2 if said first packet is stored for longest period of time among said second subset of
3 said plurality of packets in said packet reorder buffer,
4 determining whether a predetermined number of packets have been
5 forwarded ahead of said 'head of line' packet from said packet
6 reorder buffer.

1 19. (Original) The method of claim 18, further comprising:
2 if a predetermined number of packets have not been forwarded ahead of said
3 'head of line' packet from said packet reorder buffer,
4 forwarding said first packet.

1 20. (Original) The method of claim 19, further comprising:
2 if said predetermined number of packets have been forwarded ahead of said 'head
3 of line' packet from said packet reorder buffer,
4 generating an error, and
5 waiting until said 'head of line' packet is forwarded.

1 21. (Original) The method of claim 18, wherein said predetermined threshold is
2 defined during a provisioning of said router.

1 22. (Original) The method of claim 18, wherein said predetermined threshold is
2 dynamically calculated by said router.

1 23. (Original) The method of claim 20, wherein said head-of-line packet is
2 forwarded before said routing information for said 'head of line' packet is located.

1 24. (Original) A packet reordering system comprising:
2 a packet reorder buffer; and

3 a 'head-of-line' pointer.

1 25. (Original) A network element comprising the packet reordering system of
2 claim 24, further comprising:

3 a packet receiving unit coupled to said packet reordering system, said packet
4 receiving unit is configured to receive a plurality of packets.

1 26. (Original) The network element of claim 25, further comprising:
2 a packet forwarding unit coupled to said packet reordering system, said packet
3 forwarding unit is configured to forward said plurality of packets.

1 27. (Original) The network element of claim 26, further comprising:
2 a processor coupled to said packet reordering system, said processor configured to
3 determine a plurality of hash values using information contained in said
4 plurality of packets, and
5 store said plurality of hash values and said plurality of packets in said
6 packet reorder buffer.

1 28. (Original) The network element of claim 27, further comprising:
2 a network interface coupled to said processor.

1 29. (Original) The network element of claim 28, wherein said network interface
2 comprising said packet receiving and said packet forwarding units.

1 30. (Original) The network element of claim 27, further comprising:
2 a memory coupled to said processor, said memory stores a lookup table.

1 31. (Original) The network element of claim 28, further comprising:
2 a cache coupled to said processor.

1 32. (Previously Presented) A network element comprising:
2 a processor; said processor is configured to

3 receive a plurality of incoming packets in a first order;
4 separate said plurality of incoming packets into a plurality of subsets of
5 incoming packets, wherein
6 said plurality of incoming packets is separated according to
7 a plurality of characteristics of said plurality of incoming
8 packets; and
9 forward said plurality of subsets of incoming packets in a second order.

1 33. (Cancelled)

1 34. (Original) The network element of claim 32, wherein incoming packets in
2 each one of said plurality of subsets of incoming packets are forwarded in an order that
3 the incoming packets are received.

1 35. (Previously Presented) The network element of claim 32, wherein one of said
2 plurality of characteristics is a destination address of said plurality of incoming packets.

1 36. (Previously Presented) The network element of claim 32, wherein one of said
2 plurality of characteristics is a source address of said plurality of incoming packets.

1 37. (Previously Presented) The network element of claim 32, wherein one of said
2 plurality of characteristics is a protocol used by said plurality of incoming packets.

1 38. (Previously Presented) The network element of claim 32, wherein one of said
2 plurality of characteristics is an address of at least one incoming port used by said
3 plurality of incoming packets.

1 39. (Previously Presented) The network element of claim 32, wherein one of said
2 plurality of characteristics is an address of at least one outgoing port used by said
3 plurality of incoming packets.

1 40. (Cancelled)

1 41. (Previously Presented) A network element for routing packets in a router
2 comprising:
3 means for receiving a plurality of packets in a first order;
4 means for storing said plurality of packets in a packet reorder buffer;
5 means for forwarding said plurality of packets in a second order from said packet
6 reorder buffer;
7 means for determining a plurality of hash values using information contained in
8 said plurality of packets;
9 means for storing said plurality of hash values in said packet reorder buffer; and
10 means for using said plurality of hash values to determine said second order.

1 42. (Original) The network element of claim 41, wherein a first subset of said
2 plurality of packets having a common hash value is forwarded in an order in which said
3 first subset is received by said router.

1 43. (Original) The network element of claim 41, wherein said hash value is
2 determined using a destination address of said plurality of packets.

1 44. (Original) The network element of claim 41, wherein said hash value is
2 determined using a source address of said plurality of packets.

1 45. (Original) The network element of claim 41, wherein said hash value is
2 determined using a protocol used by said plurality of packet.

1 46. (Original) The network element of claim 41, wherein said hash value is
2 determined using an address of at least one incoming port used by said plurality of
3 packets.

1 47. (Original) The network element of claim 41, wherein said hash value is
2 determined using an address of at least one outgoing port used by said plurality of
3 packets.

1 48. (Original) The network element of claim 41, further comprising:
2 means for setting a status of said plurality of packets in said packet reorder buffer
3 to 'not-ready'.

1 49. (Original) The network element of claim 47, further comprising:
2 means for selecting a 'head of line' packet from said packet reorder buffer. said
3 'head of line' packet is a packet that is stored in said packet reorder buffer
4 for longest period of time; and
5 means for identifying said 'head of line' packet using a 'head of line' pointer.

1 50. (Original) The network element of claim 49, wherein said 'head of line'
2 pointer is a software based pointer.

1 51. (Original) The network element of claim 49, wherein said 'head of line'
2 pointer is a hardware-based pointer.

1 52. (Original) The network element of claim 49, further comprising:
2 means for locating a routing information for said plurality of packets in a cache;
3 means for locating said routing information in a lookup table if said routing
4 information is not located in said cache; and
5 means for setting said status of said plurality of packets in said packet reorder
6 buffer to 'ready' when said routing information is located.

1 53. (Original) The network element of claim 52, further comprising:
2 means for selecting a first packet with a 'ready' status from said packet reorder
3 buffer;
4 means for determining whether said first packet is 'head of line' packet.

1 54. (Original) The network element of claim 53, further comprising:
2 means for removing said first packet from said packet reorder buffer if said first
3 packet is 'head of line' packet;

4 means for forwarding said first packet if said first packet is 'head of line' packet if
5 said first packet is 'head of line' packet; and
6 means for moving said 'head of line' pointer to one of said plurality of packets
7 that is stored for longest period of time in said packet reorder buffer if said
8 packet reorder buffer is not empty.

1 55. (Original) The network element of claim 54, further comprising:

2 means for locating said 'head of line' packet in said packet reorder buffer if said
3 first packet is not said 'head of line' packet;
4 means for determining whether said first packet and said 'head of line' packet
5 have a common hash value if said first packet is not said 'head of line'
6 packet; and
7 means for selecting a second packet with a 'ready' status from said packet reorder
8 buffer if said first packet and said 'head of line' packet have a common
9 hash value.

1 56. (Original) The network element of claim 55, further comprising:

2 means for identifying a second subset of said plurality of packets having a
3 common hash value with said first packet from said packet reorder buffer
4 if said first packet and said 'head of line' packet do not have a common
5 hash value;
6 means for determining whether said first packet is stored for longest period of
7 time in said packet reorder buffer among said second subset of said
8 plurality of packets if said first packet and said 'head of line' packet do not
9 have a common hash value; and
10 means for selecting a third packet with a 'ready' status from said packet reorder
11 buffer if said first packet is not stored for longest period of time in said
12 packet reorder buffer among said second subset of said plurality of
13 packets.

1 57. (Original) The network element of claim 56, further comprising:
2 means for determining whether a predetermined number of packets have been
3 forwarded ahead of said 'head of line' packet from said packet reorder
4 buffer if said first packet is stored for longest period of time among said
5 second subset of said plurality of packets in said packet reorder buffer.

1 58. (Original) The network element of claim 57, further comprising:
2 means for means for forwarding said first packet if a predetermined number of
3 packets have not been forwarded ahead of said 'head of line' packet from
4 said packet reorder buffer.

1 59. (Original) The network element of claim 58, further comprising:
2 means for generating an error if said predetermined number of packets have been
3 forwarded ahead of said 'head of line' packet from said packet reorder
4 buffer, and
5 means for waiting until said 'head of line' packet is forwarded if said
6 predetermined number of packets have been forwarded ahead of said
7 'head of line' packet from said packet reorder buffer.

1 60. (Original) The network element of claim 57, wherein said predetermined
2 threshold is defined during a provisioning of said router.

1 61. (Original) The network element of claim 57, wherein said predetermined
2 threshold is dynamically calculated by said router.

1 62. (Cancelled)

1 63. (Currently Amended) A ~~computer program product for forwarding a packet~~
2 ~~in a network, encoded in~~ computer readable medium ~~media, said computer program~~
3 ~~product~~ comprising a set of instructions executable on a computer system, wherein said
4 set of instructions is configured to:
5 receive a plurality of packets in a first order;
6 store said plurality of packets in a packet reorder buffer;
7 forward said plurality of packets in a second order from said packet reorder
8 buffer;
9 determine a plurality of hash values using information contained in said plurality
10 of packets;
11 store said plurality of hash values in said packet reorder buffer; and
12 use said plurality of hash values to determine said second order.

1 64. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 63, wherein a first subset of said plurality of packets having a common hash value
3 is forwarded in an order in which said first subset is received by said router.

1 65. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 63, wherein said hash value is determined using a destination address of said
3 plurality of packets.

1 66. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 63, wherein said hash value is determined using a source address of said plurality
3 of packets.

1 67. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 63, wherein said hash value is determined using a protocol used by said plurality of
3 packet.

1 68. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 63, wherein said hash value is determined using an address of at least one incoming
3 port used by said plurality of packets.

1 69. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 63, wherein said hash value is determined using an address of at least one outgoing
3 port used by said plurality of packets.

1 70. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 63, wherein said set of instructions is further configured to
3 set a status of said plurality of packets in said packet reorder buffer to 'not-
4 ready'.

1 71. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 69, wherein said set of instructions is further configured to
3 select a 'head of line' packet from said packet reorder buffer, said 'head of line'
4 packet is a packet that is stored in said packet reorder buffer for longest
5 period of time; and
6 identify said 'head of line' packet using a 'head of line' pointer.

1 72. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 71, wherein said 'head of line' pointer is a software based pointer.

1 73. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 71, wherein said 'head of line' pointer is a hardware-based pointer.

1 74. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 71, wherein said set of instructions is further configured to:
3 locate a routing information for said plurality of packets in a cache;
4 if said routing information is not located in said cache,
5 locate said routing information in a lookup table; and

when said routing information is located, set said status of said plurality of packets in said packet reorder buffer to 'ready'.

75. (Currently Amended) The computer readable medium ~~program-product~~ of claim 74, wherein said set of instructions is further configured to select a first packet with a 'ready' status from said packet reorder buffer; determine whether said first packet is 'head of line' packet.

76. (Currently Amended) The computer readable medium ~~program-product~~ of claim 75, wherein said set of instructions is further configured to: if said first packet is 'head of line' packet, remove said first packet from said packet reorder buffer, forward said first packet, and if said packet reorder buffer is not empty, move said 'head of line' pointer to one of said plurality of packets that is stored for longest period of time in said packet reorder buffer.

77. (Currently Amended) The computer readable medium ~~program-product~~ of claim 76, wherein said set of instructions is further configured to: if said first packet is not said 'head of line' packet, locate said 'head of line' packet in said packet reorder buffer, determine whether said first packet and said 'head of line' packet have a common hash value, and if said first packet and said 'head of line' packet have a common hash value, select a second packet with a 'ready' status from said packet reorder buffer.

1 78. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 77, wherein said set of instructions is further configured to
3 if said first packet and said 'head of line' packet do not have a common hash
4 value,
5 identify a second subset of said plurality of packets having a common hash
6 value with said first packet from said packet reorder buffer,
7 determine whether said first packet is stored for longest period of time in
8 said packet reorder buffer among said second subset of said
9 plurality of packets. and
10 if said first packet is not stored for longest period of time in said packet
11 reorder buffer among said second subset of said plurality of
12 packets,
13 select a third packet with a 'ready' status from said packet reorder
14 buffer.

1 79. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 78, wherein said set of instructions is further configured to
3 if said first packet is stored for longest period of time among said second subset of
4 said plurality of packets in said packet reorder buffer,
5 determine whether a predetermined number of packets have been
6 forwarded ahead of said 'head of line' packet from said packet
7 reorder buffer.

1 80. (Currently Amended) The computer readable medium ~~program-product~~ of
2 claim 79, wherein said set of instructions is further configured to:
3 if a predetermined number of packets have not been forwarded ahead of said
4 'head of line' packet from said packet reorder buffer,
5 forward said first packet.

1 81. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 80, wherein said set of instructions is further configured to
3 if said predetermined number of packets have been forwarded ahead of said 'head
4 of line' packet from said packet reorder buffer,
5 generate an error, and
6 wait until said 'head of line' packet is forwarded.

1 82. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 79, wherein said predetermined threshold is defined during a provisioning of said
3 router.

1 83. (Currently Amended) The computer readable medium ~~program product~~ of
2 claim 79, wherein said predetermined threshold is dynamically calculated by said
3 router.